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10/661,757	09/12/2003	Christopher K. Davey	81091093	8156

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EXAMINER	
OLSEN, KAJ K	

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1795	

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Please find below and/or attached an Office communication concerning this application or proceeding.

The time period for reply, if any, is set in the attached communication.

Office Action Summary	Application No. 10/661,757	Applicant(s) DAVEY ET AL.	
	Examiner KAJ K. OLSEN	Art Unit 1795	

-- The MAILING DATE of this communication appears on the cover sheet with the correspondence address --

Period for Reply

A SHORTENED STATUTORY PERIOD FOR REPLY IS SET TO EXPIRE *3* MONTH(S) OR THIRTY (30) DAYS, WHICHEVER IS LONGER, FROM THE MAILING DATE OF THIS COMMUNICATION.

- Extensions of time may be available under the provisions of 37 CFR 1.136(a). In no event, however, may a reply be timely filed after SIX (6) MONTHS from the mailing date of this communication.
- If NO period for reply is specified above, the maximum statutory period will apply and will expire SIX (6) MONTHS from the mailing date of this communication.
- Failure to reply within the set or extended period for reply will, by statute, cause the application to become ABANDONED (35 U.S.C. § 133). Any reply received by the Office later than three months after the mailing date of this communication, even if timely filed, may reduce any earned patent term adjustment. See 37 CFR 1.704(b).

Status

1)☒ Responsive to communication(s) filed on *20 November 2007*.

2a)☐ This action is **FINAL**. 2b)☒ This action is non-final.

3)☐ Since this application is in condition for allowance except for formal matters, prosecution as to the merits is closed in accordance with the practice under *Ex parte Quayle*, 1935 C.D. 11, 453 O.G. 213.

Disposition of Claims

4)☒ Claim(s) *1-6,8 and 12-16* is/are pending in the application.

4a) Of the above claim(s) _____ is/are withdrawn from consideration.

5)☒ Claim(s) *3* is/are allowed.

6)☒ Claim(s) *1,2,4-6,8 and 12-14* is/are rejected.

7)☒ Claim(s) *15, 16* is/are objected to.

8)☐ Claim(s) _____ are subject to restriction and/or election requirement.

Application Papers

9)☐ The specification is objected to by the Examiner.

10)☐ The drawing(s) filed on _____ is/are: a)☐ accepted or b)☐ objected to by the Examiner.

Applicant may not request that any objection to the drawing(s) be held in abeyance. See 37 CFR 1.85(a).

Replacement drawing sheet(s) including the correction is required if the drawing(s) is objected to. See 37 CFR 1.121(d).

11)☐ The oath or declaration is objected to by the Examiner. Note the attached Office Action or form PTO-152.

Priority under 35 U.S.C. § 119

12)☐ Acknowledgment is made of a claim for foreign priority under 35 U.S.C. § 119(a)-(d) or (f).

a)☐ All b)☐ Some * c)☐ None of:

1.☐ Certified copies of the priority documents have been received.

2.☐ Certified copies of the priority documents have been received in Application No. _____.

3.☐ Copies of the certified copies of the priority documents have been received in this National Stage application from the International Bureau (PCT Rule 17.2(a)).

* See the attached detailed Office action for a list of the certified copies not received.

Attachment(s)

1) ☐ Notice of References Cited (PTO-892)

2) ☐ Notice of Draftsperson's Patent Drawing Review (PTO-948)

3) ☐ Information Disclosure Statement(s) (PTO/SB/08) Paper No(s)/Mail Date _____.

4) ☐ Interview Summary (PTO-413) Paper No(s)/Mail Date. _____.

5) ☐ Notice of Informal Patent Application

6) ☐ Other: _____.

DETAILED ACTION

Claim Rejections - 35 USC § 103

1. The text of those sections of Title 35, U.S. Code not included in this action can be found in a prior Office action.

2. Claims 1, 6, 8, and 12-14 are rejected under 35 U.S.C. 103(a) as being unpatentable over Shimasaki et al (USP 5,740,675) in view of Seidenfuss (USP 5,929,328) and Jelden et al (USP 5,592,815).

3. Shimasaki discloses a system and method for determining a temperature of exhaust gas from an engine comprising an exhaust gas sensor 52 having an electric heating coil where said sensor communicates with exhaust gas, an electrical circuit for generating a signal indicative of the resistances of said heating coil when said coil is not de-energized, and a controller receiving said signal and calculating said temperature of said exhaust gas based on said signal. See fig. 1, abstract, and col. 5, l. 66 through col. 6, l. 40. See also fig. 12 and 13 and col. 7, l. 39 through col. 8, l. 7 for an embodiment where an infinitesimal current is utilized (i.e. the heater is de-energized). Shimasaki further discloses that the controller generates a duty cycle to successively energize and de-energize said coil. See col. 5, ll. 8-18. However, Shimasaki does not explicitly disclose that the controller calculates the temperature during a plurality of successive de-energized periods of the duty. Rather Shimasaki in the embodiment of fig. 13 utilizes switches separate from the duty cycle to affect temperature measurement. However, Seidenfuss teaches in an alternate temperature sensing means for an exhaust gas heater that the temperature measurement can be interfaced with any duty cycle for the heater. In particular, Seidenfuss

utilizes a single switch T1 that can both de-energize the heater and allow for the measurement of a current I_M analogous to the infinitesimal current of Shimasaki. See fig. 1 and 2 and col. 2, l. 55 through col. 3, l. 18. This is in contrast to Shimasaki, which requires three switches, two (62, 66) for the measurement of the infinitesimal current and one (Tr) for control of the duty cycle. It would have been obvious to one of ordinary skill in the art at the time the invention was being made to utilize the teaching of Seidenfuss for the system and method of Shimasaki because the teaching of Seidenfuss required fewer switches, thereby simplifying circuit construction. In addition, the circuit of Seidenfuss obviates the need for a measuring resistor that can withstand the high current flows needed for the heater operation. See col. 2, ll. 8-15 and compare the prior art fig. 3 with fig. 1 of Seidenfuss and note that the prior art fig. 3 is analogous to the arrangement of fig. 3 and 13 of Shimasaki. Hence, it would have been further obvious to rely on the teaching of Seidenfuss for the circuitry of Shimasaki so as to avoid the use of a measuring resistor that must withstand the high heater currents. Furthermore, it would have been obvious to one of ordinary skill in the art at the time the invention was being made to utilize a measurement coordinated with the heater duty cycle, like that taught by Seidenfuss, for the system or method of Shimasaki for the added benefit that the duty cycle of the heater not be altered by the temperature measurement. In particular, Shimasaki presumably has set the duty cycle for the heater to a particular level that provides a desired temperature control. However, if any temperature measurement of Shimasaki would happen to occur during a time when the heater is supposed to be on (i.e. the ECU has turned switch Tr on), then the temperature measurement of Shimasaki would alter the effective duty cycle for the heater because the measurement means would have de-energized the heater irrespective of the duty cycle set for

switch Tr. Utilizing Seidenfuss, which only measures a temperature when the heater was supposed to be off anyway would thereby prevent an altering of the effective heater duty cycle.

4. With respect to the temperature measurement being calculated during a plurality of successive de-energized periods, the temperature calculation routine of Shimasaki is apparently only performed a single time for the purpose of either calculating an appropriate VEHC and TON when Tcat is between A and B or determining that no heater current supply is necessary for the EHC unit. However, Jelden teaches that temperature measurements both before and after a catalyst can be utilized for monitoring the conversion rate of the catalyst. See fig. 2 and col. 1, ll. 37-64. Because Shimasaki has already provided a temperature sensor within the exhaust line for determining whether current need be supplied to the heater catalyst upon engine start up, then it would have been obvious to one of ordinary skill in the art at the time the invention was being made to extend the utility of that temperature measurement device other uses of temperature sensor in exhaust line known in the art, such as for determining the catalyst efficiency as suggested by Jelden, to yield the predictable result of providing an appropriate measure of the catalyst efficiency as well. With respect to monitoring this temperature in successive de-energized periods of the heater duty cycle, Shimasaki already discloses the use of a duty cycle for its heater (col. 5, ll. 5-18) and Seidenfuss teaches only monitoring the temperature of a heater when the heater is de-energized so as to avoid the need for high current measuring resistors and to avoid the need for interrupting the normal heater cycle (col. 2, ll. 1-15 and l. 64 - col. 3, l. 9). Hence, it would have been obvious to one of ordinary skill in the art at the time the invention was being made to provide the temperature measurements needed by Jelden during successive de-energized periods of the heater cycle.

5. With respect to determining the oxygen content as well, the oxygen sensor is clearly also being utilized to determine the oxygen content of the exhaust gas as well. See the abstract. Furthermore, the temperature is being determined just after engine ignition and before the engine has warmed up (i.e. prior to the coolant temperature reaching a predetermined value). See Shimasaki, fig. 2 and col. 5, l. 48 through col. 6, l. 16.

6. With respect to comparing a first exhaust gas temperature to a second exhaust gas temperature, Jelden teaches the use of comparing first and second exhaust gas temperature at different locations in the exhaust gas system. See fig. 1 and col. 1, ll. 37-64.

7. With respect to an additional oxygen sensor upstream from the catalyst, Shimasaki disclose an oxygen sensor 50 upstream from the catalysts (20, 22) with oxygen sensor 52 being downstream from these catalysts. See fig. 1 and col. 4, ll. 19-35.

8. Claim 2 is rejected under 35 U.S.C. 103(a) as being unpatentable over Shimasaki in view of Seidenfuss and Jelden as applied to claim 1 above, and in further view of Takeuchi et al (USP 4524,264).

9. The references disclose all the limitations of the claims, but did not explicitly recite the use of a Wheatstone bridge circuit operably coupled to the gas sensor. Takeuchi teaches that the heater of a gas sensor can be placed within a Wheatstone bridge to regulate the power supplied to the heater such that a constant temperature for the heater is established. See fig. 4 and col. 6, ll. 48-68. It would have been obvious to one of ordinary skill in the art at the time the invention was being made to utilize the teaching of Takeuchi for the system of Shimasaki and Seidenfuss so as to provide a well-regulated and consistent temperature.

10. Claims 4 and 5 are rejected under 35 U.S.C. 103(a) as being unpatentable over Jelden et al (USP 5,592,815) in view of Shimasaki and Seidenfuss.

11. Jelden discloses a system for determining a temperature difference of exhaust gas comprising a first temperature sensor 4 communicating with exhaust gas upstream of the catalyst 3 generating a first temperature signal, a second temperature sensor 5 communicating with exhaust gas downstream of the catalyst generating a second temperature signal, and a controller calculating a temperature difference between exhaust gas communicating with said first and second temperature sensors based on the first and second signals. See fig. 1 and col. 4, ll. 10-58. Jelden does not explicitly disclose the use of first and second exhaust gas sensors for the generation of the temperature signals, particularly the use of the heating coil of an exhaust gas sensor. Shimasaki discloses that a separate temperature sensor for monitoring temperature is not necessary because one can rely on a measurement of the heater coil resistance from an oxygen sensor, which Shimasaki teaches that most internal combustion engines are already equipped with anyway. See the abstract, col. 1, ll. 23-56, and col. 5, l. 66 through col. 6, l. 40. Furthermore as discussed above, Seidenfuss taught the use of a temperature measurement means that provides for the temperature measurement only during de-energized portions of the duty cycle. See the discussion above and in the previous office action. It would have been obvious to one of ordinary skill in the art at the time the invention was being made to utilize the teaching of Shimasaki and Seidenfuss for the system of Jelden so as to provide simultaneous oxygen and temperature sensing without requiring separate temperature and oxygen sensors. With respect to the measurement of successive de-energizing periods, because Jelden is relying on essentially continuous temperature measurements (see fig. 2), one would have been motivated to provide the

temperature measurements of Shimasaki in view of Seidenfuss during successive de-energized periods so that the temperature can be repeatedly rechecked.

12. With respect to claim 5 (those limitations not covered above), requiring an electric circuit coupled to both the first and second electric heating coils, both of the circuits of Shimasaki and Seidenfuss rely on a connection to both the car battery and ground. See fig. 13 of Shimasaki and fig. 1 and 2 of Seidenfuss. Hence even if different circuit portions are utilized for the determination of the temperature of both the first and second heating coil, because these circuit portions both contain the common elements of the battery and ground and these two circuit portions would read on the specified electrical circuit coupled to both the first and second heating coils.

Allowable Subject Matter

13. Claim 3 is allowed.

14. Claims 15 and 16 are objected to as being dependent upon a rejected base claim, but would be allowable if rewritten in independent form including all of the limitations of the base claim and any intervening claims.

15. The following is a statement of reasons for the indication of allowable subject matter: With respect to claim 3, the prior art does not disclose nor render obvious all the cumulative limitations of the claim with particular attention to coupling the heater coil in series with a measuring resistance circuit during a de-energizing and uncoupling with the measuring resistance circuit during said energizing. Similarly for claim 15, the prior art does not disclose nor render obvious all the limitations of claim 1 and further comprising the specified switching

circuit for coupling the heater coil in series with a measuring resistance circuit during a de-energizing and uncoupling with the measuring resistance circuit during said energizing. Both Shimasaki and Seidenfuss teach the use of a measuring resistance that is always coupled to the heating coil irrespective of whether the heater coil is being energized or de-energized. Claim 16 depends from claim 15.

Response to Arguments

16. Applicant's arguments filed 11-20-2007 have been fully considered but they are not persuasive. Applicant urges that one skilled in the art, confronted with the teachings of Shimasaki and Seidenfuss, would be met with several irreconcilable features. In particular, applicant urges that Shimasaki is designed to control the heater function and temperature estimation function separately so that the temperature reading is not confounded with the heater function. It is unclear why applicant believes this is in conflict with Seidenfuss because Seidenfuss also teaches not confounding the temperature measurement with the heater function. In particular, Seidenfuss is attempting to avoid the need for high powered measuring resistors for monitoring the temperature and teaches instead measuring a resistance during a period when the heater power is not being supplied to the heater. See col. 2, ll. 1-26. This is entirely analogous to Shimasaki, which is also teaching monitoring a resistance when high current heater power is not being supplied to the heater. Moreover as the examiner argued in the previous office action (paragraph 4 from the 9/04/2007 office action), separating the temperature measurement from the heater function as sought by Shimasaki would have been better realized with the circuit configuration of Seidenfuss because Seidenfuss is only monitoring the temperature when the

heater current supply was to be terminated anyway (col. 2, l. 64 - col. 3, l. 9). Hence, the circuit of Seidenfuss is configured to not upset the normal duty cycle for the heater, in contrast to Shimasaki which can only monitor the temperature with an infinitesimal current by interrupting the normal heater current cycle. Furthermore, the circuit of Seidenfuss obviates the need for high powered measuring resistors, which would have presumably been required for Shimasaki because measuring resistor R0 is in the same current loop as the heater 52a and hence would have had to have withstood the high currents exposed to the heater.

17. Applicant further urges that Seidenfuss is principally concerned with detecting proper operation of the heater, and not the ambient exhaust system temperature. Again it is unclear why applicant believes this to be a conflict as Shimasaki already admitted that it was known in the sensor art to utilize diagnostic circuits connected to the heater (e.g. diagnostic circuits like those shown by Seidenfuss). What the Shimasaki realized was that those same heater diagnostic circuits could be utilized to also determine the ambient temperature of the exhaust gas system. See col. 1, ll. 42-56. Hence, Shimasaki is drawn to utilizing heater diagnostic circuits, such as the diagnostic circuit of Seidenfuss, for the estimation of the exhaust gas temperature. Again, this is not an irreconcilable difference between the two teachings because Shimasaki is precisely drawn to bridging the gap between these teachings.

18. Applicant urges that there is an additional conflict because neither reference recognized a way to coordinate heater heating with ambient temperature measurement. The examiner disagrees because Seidenfuss taught a heater diagnostic circuit that monitor the temperature of the heater only during de-energized periods of the heater operation (col. 2, l. 64 - col. 3, l. 9) and Shimasaki taught utilizing heater diagnostic circuits for the purpose of estimating ambient

temperature (col. 1, ll. 42-56). Hence the prior art renders obvious a system that coordinates the heater heating with an ambient temperature measurement.

19. With respect to the rejection relying on the further teaching of Takeuchi, applicant urges that the instant invention is utilizing the Wheatstone bridge in generating the signal when the heater coil is de-energized, whereas Takeuchi utilizes the Wheatstone bridge for power regulation. It is unclear the relevance of this fact considering that claim 2 states nothing about how the Wheatstone bridge is to be utilized. Moreover, both Shimasaki and Seidenfuss teach the use of the same circuit for both heating and temperature measurement. Hence the use of a Wheatstone bridge for power regulation in Shimasaki and Seidenfuss would also mean that the Wheatstone bridge would also be present during the temperature measurement.

20. With respect to the rejection relying on Jelden as a primary teaching, applicant urges that Jelden is drawn to making temperature measurements "at all times", which is irreconcilable with claims 4 and 5. Applicant did not elaborate on this point so it is not entirely clear what applicant is alluding to. If applicant is suggesting that "at all times" cannot read on measuring the temperature during successive de-energizing periods, this is not persuasive because a continuous measurement "at all times" can be a series of discrete measurements during those times. For the sake of argument, if we assumed the heater cycle of Shimasaki cycled the heater on and off every two seconds (i.e. the heater was on for one second and off for one second), a temperature measurement during those de-energized periods could be taken every two seconds. A discrete measurement taken repeatedly every two seconds over the entire time the engine is being operated would clearly read on a measurement "at all times" during the engine operation even though the measurement was taken at discrete points during that operation.

Conclusion

Any inquiry concerning this communication or earlier communications from the examiner should be directed to KAJ K. OLSEN whose telephone number is (571)272-1344. The examiner can normally be reached on M-F 7:00-4:30.

If attempts to reach the examiner by telephone are unsuccessful, the examiner's supervisor, Nam X. Nguyen can be reached on 571-272-1342. The fax phone number for the organization where this application or proceeding is assigned is 571-273-8300.

Information regarding the status of an application may be obtained from the Patent Application Information Retrieval (PAIR) system. Status information for published applications may be obtained from either Private PAIR or Public PAIR. Status information for unpublished applications is available through Private PAIR only. For more information about the PAIR system, see http://pair-direct.uspto.gov. Should you have questions on access to the Private PAIR system, contact the Electronic Business Center (EBC) at 866-217-9197 (toll-free). If you would like assistance from a USPTO Customer Service Representative or access to the automated information system, call 800-786-9199 (IN USA OR CANADA) or 571-272-1000.

/Kaj K Olsen/
Primary Examiner, Art Unit 1795
February 9, 2008